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ABSTRACT

A longitudinal investigation of the social and cognitive development of male twins was conducted when twins were 2.5 years of age, and again when they were 8- to 10-years-old. This study was designed to re-examine the heritability of the traits studied at the earlier age and, thus, to address the question of the stability of genetic determination. The sample of the original study consisted of 46 sets of male twins, 17 of which were monozygotic and 29 dizygotic. At follow-up, 35 pairs (13 monozygotic and 22 dizygotic) participated. The earlier study investigated the genetic determination of social characteristics, speech, and vocabulary intelligence quotient. The follow-up focused on genetic and environmental factors associated with the same characteristics, as well as antisocial and neurotic behavior, nonverbal ability, school achievement, height, and weight. At the age of 9 years, significant genetic variance, replicated by two methods of calculation, was found in height, weight, nonverbal intelligence quotient, and antisocial behavior. Shared family environmental influences were important for compliance, conscience, and antisocial behavior. Social traits were thus under less genetic influence than were physical and cognitive characteristics. Both genetic and environmental factors were important for antisocial behavior. Stable genetic determination across earlier and later ages was found only for speech.
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The Stability of Genetic Determination from Age 2 to Age 9:
A Longitudinal Twin Study

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Abstract

In an earlier study of 46 pairs of male twins genetic determination of certain social characteristics, speech, and vocabulary IQ was assessed at age 2½. In a follow-up of 35 of these pairs at age 9, genetic and environmental factors were examined again in the same characteristics, as well as in antisocial and neurotic behavior, nonverbal ability, school achievements, height and weight. At 9, significant genetic variance, replicated via 2 methods of calculation, was found in height, weight, nonverbal IQ and antisocial behavior (teacher's rating). Shared family environmental influences were important for compliance, conscience and antisocial behavior (parents' ratings). Social traits were thus less under genetic influence than were physical and cognitive characteristics, and for antisocial behavior genetic and environmental factors were both important. Stable genetic determination across both ages was found only for speech, measured by speech rate at 2 and speech maturity at 9.

THE STABILITY OF GENETIC DETERMINATION FROM AGE 2 to AGE 9: A LONGITUDINAL TWIN STUDY

The genotype is by definition a life-long property of the organism. If a genetic contribution to the phenotypic expression of a given trait can be shown only at one age, special mechanisms (e.g., the switching on and off of genes during development) may possibly explain the phenomenon (see below for a discussion). However, if a trait can be shown to have significant genetic variance repeatedly at different ages, the demonstration of at least partial genetic control becomes that much more convincing.

What is the evidence from existing longitudinal twin studies about the extent and the areas in which genetic determination has been found repeatedly at different ages? The major North American study that has followed the development of twins over age is the Louisville Twin Study that comprises about 300 twins whose mental test performance has been studied from 3 months to 15 years of age (Wilson, 1978, 1983). Genetic variance in IQ scores increased, and between-family environmental influences decreased, in this sample between 1½ and 8 years. Summarizing these findings from an epigenetic perspective Wilson (1978) concludes that "...the course of mental development is guided by the intrinsic scheduling of the genetic program acting in concert with maturational status and environmental influence." (p. 939).

Fischbein (1981) traced the physical and mental development of twins from 9 to 15 years of age in a sample of initially 323 pairs of twins. She found that in logical-inductive ability differences between the zygosity groups stayed the same, implying a similar genetic component over age, whereas in verbal ability dizygotic twin partners became less

(1981) in tracing the development of temperamental characteristics in twins from infancy to age 6 confirmed that some of these display consistent genetic determination across this age span, but that environmental factors may be more important for aspects of temperament involved in the "difficult child" syndrome.

Dworkin, Burke, Maher and Gottesman (1976, 1977) carried out an investigation of the genetic determination of personality traits, assessed by the MMPI and the California Personality Inventory (CPI), at adolescence and at adulthood, as well as of the changes between those ages. The traits of anxiety, depression and dominance showed significant genetic variance at both adolescence and adulthood, others exhibited it only at one age. Genetic variance was also significant for the profile contour of the CPI at adolescence and adulthood, and for the changes between these ages.

Clearly, consistent genetic determination over age has been demonstrated for cognitive ability and also for a few personality traits. In the latter case firm conclusions are difficult, but it appears that heritability of personality traits is more consistent at adolescence and beyond than at younger ages (cf. Goldsmith, 1983).

A longitudinal investigation of the social and cognitive development of male twins, seen first at 2½, and again when they were 8 - 10 years old, presented us with a welcome opportunity to re-examine the heritability of the traits studied at the earlier age and thus to address the question of stability of genetic determination. The aim of the 2-year investigation had been firstly, to relate the social characteristics of attachment, independence, compliance and internalized standards, plus speech facility and vocabulary, to parents' child-rearing practices, and secondly, to assess possible genetic determination of these

characteristics (Lytton, 1980). At the time of follow-up we were able to estimate again the genetic variance of those characteristics that had already been submitted to a genetic analysis when the twins were 2. The genetic analysis was also extended to characteristics measured for the first time at age 9.

Method

Subjects

The sample of the original study consisted of 46 sets of same-sex male twins (17 monozygotic [MZ], 29 dizygotic [DZ]). Mean age was 32.2 months, range 25-35 months.

Twins were located through the birth registers of the local hospitals and they represented almost the total male twin population born during 1969 and 1970 in a Calgary, Canada. The sample contained one-third middle class and two-thirds working class families (all white), as assessed by father's occupation (Blishen, 1967).

At follow-up, at 8 - 10 years of age, we were able to locate 43 of the 46 original twin families. We received consent to obtain information from school records on 37 pairs, and 35 pairs (13 MZ and 22 DZ) participated fully in the investigation. The mean age of the twins was 9 years 6 months, and the range 8 years 5 months to 10 years 8 months.

Procedures

The methods of the 2-year investigation are described in detail in Lytton (1980). Observations of unstructured interactions between parents and children in the home, coded in detail, yielded summary behavior counts. Mothers were asked to write a "diary" account of all events involving the child within a 24-hour period and they were given a standard interview. The interview followed a structured interview format with possibilities for extra probes. It was concerned with parents'

perceptions of their children's personality characteristics and with parents' attitudes and practices in relation to child-rearing. Based on the combined evidence of the observations, the "diary" and specified interview questions, the children were rated on the target characteristics and the mothers on their child-rearing practices and attitudes.

The Peabody Picture Vocabulary Test (Dunn, 1965) was administered to the children by a trained psychologist in an experimental playroom.

At age 9 the children were assessed at home and at school. The purpose of the home-based assessments was to obtain measures on the same social characteristics of the children that had been assessed at age 2 (see above), plus measures of twin and peer relations, and the children's social adjustment. In addition, present family roles and relationships were to be assessed. However, a structured family interaction session (FI) was substituted for the observation of unstructured parent-child interaction, because of the greater self-consciousness of 9-year-old children in the presence of an observer.

An interview was given to mothers and fathers separately. This interview paralleled in content and form the interview which had been given to mothers at the time of the 2-year study. The interviews were taped and later transcribed. The rater-interviewer rated a given trait on a 5-point scale, on the basis of the responses to all questions related to this trait. For a few traits the observations from the FI were also taken into account. Interrater reliabilities, established by having a second rater rate six protocols, had a median of .88, with only two falling below .70.

Child traits that were studied at age 2 (see above) were repeated and defined in an identical way, but interview questions were modified in

accordance with changed age expectations. A question on quality of peer relations was added to the original set of questions.

Each parent also completed Rutter's Children's Behavior Questionnaire (CBQ), which is a screening test for psychological maladjustment, with parallel forms for parents and teachers. Its reliability and validity (Rutter, Tizard & Whitmore, 1970) are satisfactory. Individual items are added up to form a total Maladjustment score, as well as a Neurotic subscore and an Antisocial subscore.

The second home visit was devoted to the observation of family interaction (FI) revolving round three structured tasks, which were designed to elicit family roles, relationships and interactions. The tasks were: 1) a common construction with Lego, 2) "Pull for Pennies", a game adapted from the Madsen Cooperation Board (Madsen, 1967), and 3) a family discussion on topics set by the investigator, concerning the disposition of money earned in Pull for Pennies and typical disciplinary problems in the home. The session was videotaped and transcribed. Counts of certain interactive behaviors and ratings for cooperation in the Pull for Pennies task were converted to T-scores and combined to form the summary variables: Dominance, Organization of Task Activity, Cooperation and Conflict. 34 families participated in the FI. Reliabilities for the FI counts were calculated by having two researchers code two segments from the videotapes of each of six families. The reliabilities ranged from .72 to .99, with a median of .85.

At school classroom teachers were asked to complete a Child Rating Scale of 28 items. The scale was devised to measure the same child behaviors that were rated from the parent interview, but viewed from the perspective of the school. In addition, the scale included questions on the child's intellectual ability and school achievements. No interrater

were based on behavior which, at age 2, is notoriously fluctuating and volatile - though reliabilities between two scorers for ratings and experimental scores were quite satisfactory.

The results of the 9-year genetic analysis are shown in Tables 1 and 2. Our first criterion for the presence of a significant genetic contribution to the variance of a given trait is the rough test provided by the F ratio of $\underline{MS}$ within DZ / $\underline{MS}$ within MZ (Vandenberg, 1968). As a second criterion we present the difference between the MZ and DZ intra-class correlations (Goldsmith, 1983). Where this is found to be significant, too, we can more confidently accept the genetic component as "real". To meet the assumptions of the method, variables whose total variances for MZ and DZ twins differed significantly were excluded from consideration. This occurred only in the case of some social characteristics.

Physical and Cognitive Characteristics

Insert Table 1 about here

As shown in Table 1, height and weight have important genetic components; these results confirm expectations and reinforce the validity of the analysis. For Verbal IQ the $\underline{MS}$ within MZ exceeds the $\underline{MS}$ within DZ (hence no F ratio was calculated) and the DZ intra-class correlation is larger than the MZ correlation. These relationships, in fact, duplicate what we found for the Peabody Picture Vocabulary Test at age 2. Hence they can not be attributed to unreliability of testing at age 2, or the peculiarities of the verbal test at age 9. The vocabulary that children have acquired therefore appears, in our sample, to be heavily dependent on environmental, and not on genetic factors. Nonverbal IQ, however, has a

genetic component that is just significant (F ratio), and the presence of genetic variance is confirmed by the significant difference between the MZ and DZ correlations. Spelling (test measure), similarly shows a significant genetic component by both criteria. Since the MZ correlation is more than twice the DZ correlation, the difference should be viewed with reservation, as it would yield a heritability greater than the MZ r , which, according to the logic of the genetic analysis, forms the upper boundary of the heritability ($h^2 = 2 (r_{MZ} - r_{DZ})$; cf. Goldsmith, 1983). However, the significant F ratio confirms the presence of a genetic component and the lower DZ r could be explained by other factors, e.g., nonadditive genetic variance (cf. Loehlin, 1986).

The speech maturity rating shows significant genetic variance, but by the F test criterion alone. At age 2 it was the rate of speech that displayed a significant genetic component, the maturity rating did not. The genetic determination of speech thus appears to remain stable from age 2 to 9, if we are willing to equate the two different measures of the ability.

The objection may be raised that the greater MZ similarity on teacher ratings may be due to teachers entertaining a stereotype about MZ twins' likeness. Fortunately we were able to test this hypothesis, since 10 MZ and 16 DZ pairs were in different classrooms, and 5 MZ and 6 DZ pairs in the same classrooms. We therefore compared the differences in the ratings of twin partners in the same classroom with those in different classrooms, for MZ and DZ twins, by ANOVA. If teachers' ratings were influenced by a stereotype of MZ likeness, the ratings for the MZ twins in the same classrooms should be closer to each other than those in different classrooms. While the ratings by the same teacher tended to be more similar than those by different teachers, for both MZ and DZ twins, no

significant difference between the two classroom conditions (same/different) emerged, nor was any interaction between classroom condition and zygosity (MZ/DZ) significant. Indeed, teachers' ratings for math and written composition showed greater differences for MZ twin partners in the same, than for those in different classrooms, though the differences did not reach significance. It is clear, therefore, that the greater similarity of teachers' judgments of MZ twins is not attributable to any preconceived stereotype. (As we have demonstrated previously (Lytton, 1980), parents do not either deliberately create a more similar environment for their own MZ twins, but rather react to their genetic likeness.)

In general, a high intra-class correlation indicates a high degree of similarity between twin partners within the family and, conversely, significant differences between families. Where the correlations for both MZ and DZ groups are significant but equal, there is no evidence for any genetic effect, and in its absence the similarity must be due to very similar environmental forces influencing the twin partners. This configuration occurred for three achievement tests: reading recognition, reading comprehension and general information. It is interesting to note that reading and general information seem to be influenced by environmental similarities within, and by environmental differences between families, whereas spelling shows some evidence of genetic control. This links up with the finding that particularly in older, "dyslexic" children (where severe reading and writing difficulties are accompanied by neurological defects) defective spelling is often more marked than reading disability (cf. Keeney & Keeney, 1968; Vernon, 1971). Thus our finding of a possible genetic component in spelling would lend credibility to an organic explanation for severe spelling disability.

Social Characteristics

Insert Table 2 about here

We now turn to the social characteristics (Table 2), most of which were also assessed at 2, though at 9 modifications for age were introduced. Seven variables have been omitted from the Table: four were not considered because total variances differed between MZ and DZ twins - Independence (mother interview), Attachment (father interview), Dominance (FI), and Cooperation (FI); three have been omitted because one or both correlations had a negative value: Guilt Index, Moral Reasoning, Independence (teacher rating).

We will select for mention the characteristics that showed significant heritability either via two methods (see above), or via at least two raters (mother, father or teacher) since such repeated demonstration of a genetic component is an indication of a relatively reliable finding. The teacher rating of Compliance shows evidence of a genetic component via both methods of assessing significance, but the home-based ratings do not. The Maladjustment scores, assigned by mother, father and teacher, display significant heritability across all three raters, and in the case of the teacher rating this is so via both methods. However, the evidence from the differences between MZ and DZ correlations for Compliance and Maladjustment teacher ratings must be suspect, since the MZ correlations are more than twice the DZ ones (see above). The most definite demonstration of genetic variance is evidenced by Antisocial behavior (a subscore of Maladjustment), as both mother and teacher ratings show a genetic component, and in the latter case this is confirmed by both criteria without qualification. The Neurotic subscore, on the other hand,

shows no genetic variance. Other indications of heritability in the Table are confined to one method of calculating it and to one rater and should therefore be treated with some caution.

Which characteristics show significant and equal correlations between twin partners for both MZ and DZ groups, suggesting between-family environmental influences? Compliance, rated from mother's interview, and Conscience, rated from both mother's and father's interviews, do so. Maladjustment total and the Antisocial subscore, as rated by both mother and father, also manifest strong within-families environmental similarities. In the case of mothers' ratings there is also evidence of a significant genetic component for these characteristics, as assessed by the F ratio. The co-action of genetic and environmental forces in these characteristics provides confirmatory evidence for the assumption that both heredity and environment shape the phenotypic expression of these dispositions. That evidence for significant similarity of DZ twins and, therefore, of familial environmental forces, comes from mother and father (except for neurotic tendencies) must be seen in the light of the fact that parents are in the best position to see such similarity among their twins and are themselves chiefly responsible for creating environments for them.

Genetic Factors in Changes From Age 2 to 9

Insert Table 3 about here

For parallel variables, measured at both age 2 and age 9, we calculated "change scores" by subtracting the 2-year z-scores from the 9-year z-scores and carried out a genetic analysis of these change scores. This was done for vocabulary - verbal IQ, for mother interview-based

ratings of Attachment, Compliance, Conscience and Independence, and for the teacher rating of Speech. The only variables whose growth demonstrated significant genetic variance (by one method only) were the Independence and Speech ratings (Table 3). Note that the Independence rating itself had a significant genetic component at 2, and the Speech rating at 9. Changes over age therefore were not under greater genetic control than the characteristics measured at each age.

Discussion

Fifty percent of the physical and cognitive variables tested showed significant heritability by one or the other method and 22% by both methods, but for the social characteristics the corresponding figures are only 36% and 11% respectively. The analysis thus demonstrates less genetic determination in social than in physical and cognitive aspects of the personality. This result is in line with findings from many previous investigations, which found only patchy evidence for genetic components in personality or temperament characteristics overall (e.g., Goldsmith & Gottesman, 1981; Jensen, 1967; Matheny, 1980; Portenier, 1939; Plomin & Rowe, 1979; Vandenberg, 1967). On the other hand, there has been repeated evidence for a genetic component in certain specific social traits, such as "sociability" and "extroversion-introversion" (cf. Buss & Plomin, 1975; Eaves & Eysenck, 1975; Loehlin, 1986; for a further discussion see Lytton, 1980, chapter 9).

At age 9 we have demonstrated significant genetic variance in replicated form in the physical characteristics of height and weight, in nonverbal IQ (a cognitive variable), and in social maladjustment, particularly antisocial behavior. That verbal ability may be more under environmental control and nonverbal ability more genetically determined has previously been reported by Mittler (1971). However, in view of the

consistent genetic component that our investigation uncovered in speech competence, both at age 2 and at age 9 (though by one method only), it is surprising that the ability to acquire vocabulary and define words, assessed by both our verbal IQ tests, should not be influenced by genetic factors. The small sample size - unavoidable, since this was a follow-up of an observational study - may be responsible for some instability in the results.

How much stable genetic variance could we detect in parallel measures at age 2 and age 9? The measures, we should emphasize, were parallel, not identical. Speech was the one characteristic that showed consistent heritability, but only if we are willing to equate the amount of speech at 2 with the speech maturity rating at 9. Independence had significant heritability at 2, but at 9 the evidence for a genetic component, arising from the difference in correlations for father's rating, is fragile. For Compliance and for Attachment to mother significant genetic variance emerged only at age 9, but in each case the evidence must be treated with caution. Conscience and Vocabulary IQ consistently failed to show any genetic variance at either age.

The inconsistent findings of genetic variability from age 2 to age 9 may be due to the scales, e.g., for Independence and Compliance, measuring somewhat different functions at the two ages, particularly if assessed in different locales - school or home. However, the small size of the sample should warn us against accepting nil results too readily. Where we have solid grounds for expecting genetic variance, such as in height and weight, even the small sample displayed significant heritability. But where there is a lesser degree of genetic variance a small sample may be unable to detect it (cf. Martin, Eaves, Kearsy & Davies, 1978). It may be that the conflicting phenomena of emerging and disappearing genetic

components over age can be explained by other factors, e.g., a change from an expressive to a suppressive environment, or vice-versa (cf. Dworkin, et al., 1976), or the switching on and off of genes during development (cf. Ho, Foch & Plomin, 1980). However, such claims are difficult to substantiate empirically for ordinary human characters.

The correlations between twin partners for these social characteristics were generally higher at 2 than at 9, i.e. twin similarity was greater at the earlier age. At age 2 the components of variance analysis showed that for most of the social characteristics the largest part of the variance was explained by differences between families of environmental and cultural origin. This declined somewhat by age 9, i.e. the intra-class correlations tended to be lower (with some exceptions) particularly for MZ twins. This suggests that differences between MZ twin partners widened over the years, perhaps because their experiences in their enlarged social environment diverged. However, low correlations are not only due to systematic within-families differences. Indeed, Loehlin & Nichols (1976) showed that when differences in parental treatments of the twins were quantified, such differences were not related to personality differences among twin partners. Low correlations will also be due to error and noise of measurement, and this source of variance will be inextricably confounded with systematic treatment differences within the family.

Heritability can be assessed by different methods, and results across methods, samples and ages are often only patchily significant. Before accepting a genetic component as "real", one should therefore require a replicated demonstration of significant heritability, be it via several methods or for several ages or, best of all, across several samples.

We have shown significant genetic variance in replicated form at age 9 for a few characteristics (see above). The robust evidence of genetic variance in children's behavior disorders is perhaps the most important finding of this study. It confirms evidence from other research which has shown genetic factors playing a role in adult antisocial behavior (cf. Rutter & Giller, 1983) and familial factors, which could be both environmental and genetic, in children's conduct disturbances (Stewart, DeBlois & Cummings, 1980). In general attempts to replicate genetic analyses over several samples have shown that the reliable demonstration of genetic determination for the normal range of most social characteristics remains more difficult than for cognitive ones.

In keeping with this limitation we were able to detect stable genetic determination from age 2 to age 9 only in the cognitive characteristic of speech facility, and even here genetic variance appeared in different operationalizations of this construct at the two ages. Overall, the evidence in the literature for stability of genetic determination of social personality characteristics is not strong (see above). Only certain defined personality variables in some investigations (Dworkin et al., 1976, 1977) seem to show consistent genetic determination over age, and this can be more clearly demonstrated from adolescence on than from early childhood. This may be the essential reason why we discovered consistent heritability in only one cognitive characteristic.

Table 1

Genetic Analysis of Physical Attributes and Cognitive Abilities

	Number of Pairs		F $\frac{MS_{WD}}{MS_{WM}}$	Intraclass r^a		p of $r_{MZ} - r_{DZ}$ (1-tailed)
	MZ	DZ		MZ	DZ	
Height	14	22	4.17**	.90*	.51*	.01
Weight	14	22	5.58**	.88*	.46*	.01
Verbal IQ (Crichton Vocab.)	13	22	b)	.18	.84*	
Nonverbal IQ (Raven's Matrices)	13	22	2.37*	.82*	.44*	.05
Mathematics (PIAT)	13	22	1.43	.64*	.34	
Reading Recognition (PIAT)	13	22	1.75	.82*	.57*	
Reading Comprehension (PIAT)	13	22	b)	.55*	.44*	
Spelling (PIAT)	13	22	4.51**	.81*	.24	(.05) ^c
General Information (PIAT)	13	22	1.04	.68*	.53*	
Intellectual Ability-Teacher rating	15	22	2.49*	.58*	.25	
Speech Maturity - Teacher rating	15	22	2.52*	.52*	.26	

Note. MS_{WM} : Mean Square within MZ pairs; MS_{WD} : Mean Square within DZ pairs.

PIAT: Peabody Individual Achievement Test.

^aCorrelations significant at .05 level or better are indicated by *.

^b $\frac{MS_{WM}}{MS_{WD}}$

^cParentheses indicate that the MZ r is more than twice the DZ r

*p .05; **p .01.

Table 2

Genetic Analysis of Social Characteristics

	Number of Pairs		$\frac{F}{MS_{WD}}$	Intraclass r^a		$\frac{p \text{ of } r_{MZ} - r_{DZ}}{(1\text{-tailed})}$
	MZ	DZ		MZ	DZ	
Teacher dependence - TR	15	22	1.61	.63*	.28	
Peer dependence - TR	15	22	1.24	.29	.14	
Attachment - MIV	13	22	2.91*	.46*	.15	
Independence - FIV	12	16	1.45	.72*	.26	(.05) ^c
Compliance - TR	15	22	3.73**	.70*	.09	(.05)
Compliance - MIV	13	22	2.17	.60*	.55*	
Compliance FIV	12	16	1.59	.69*	.38	
Conscience - TR	15	22	1.04	.35	.38*	
Conscience - MIV	13	22	1.22	.69*	.77*	
Conscience - FIV	12	16	2.54	.93*	.63*	
Peer relations - TR	15	22	1.80	.74*	.30	(.05)
Peer relations - MIV	13	22	1.76	.32	.16	
Peer relations - FIV	12	16	2.04	.77*	.56*	
Maladjustment - TR	15	22	2.44*	.76*	.22	(.05)
Maladjustment - MIV	13	22	3.08*	.83*	.56*	
Maladjustment - FIV	12	16	2.68*	.86*	.62*	
Neurotic Index - TR	15	22	1.24	.60*	.44*	
Neurotic Index - MIV	13	22	1.80	.55*	.18	
Neurotic Index - FIV	12	16	1.88	.49*	.01	
Antisocial Index - TR	15	22	2.36*	.85*	.47*	.05
Antisocial Index - MIV	13	22	3.74**	.87*	.67*	
Antisocial Index - FIV	12	16	b)	.96*	.96*	
Organization of Task - FI	12	22	1.13	.14	.40*	
Conflict - FI	12	22	1.48	.30	.45*	

Note. MS_{WM} : Mean Square within MZ pairs; MS_{WD} : Mean Square within DZ pairs.

TR: Teacher rating; MIV: Mother interview;

FIV: Father interview; FI: Family interaction variable.

^aCorrelations significant at .05 level or better are indicated by *.

^b $\frac{MS_{WM}}{MS_{WD}}$

^cParentheses indicate that the MZ r is more than twice the DZ r .

*p .05; **p .01.

Table 3
Genetic Analysis of Change Scores from Age 2 to Age 9

	Number of Pairs		$\frac{F}{MS_{WD}}$	Intraclass r^a	
	MZ	DZ		MZ	DZ
Independence (Mother interview)	13	22	3.09*	.63	.56
Speech maturity (Interviewer rating, Age 2; Teacher rating, Age 9)	15	22	2.79*	.66	.47

Note. MS_{WM} : Mean square within MZ pairs; MS_{WD} : Mean square within DZ pairs.

^aAll correlations significant at .05 level or better.

* p .05.

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